

- 1 1. A method for performing time slot switching of synchronous data across an  
2 asynchronous medium comprising:
  - 3 (a) converting synchronous serial data related to a source time slot into  
4 synchronous parallel data units in accordance with a synchronous clock signal;
  - 5 (b) formatting the synchronous parallel data units into a first subpacket in  
6 accordance with the synchronous clock signal, the first subpacket generated during a  
7 first synchronization interval of the synchronous clock signal;
  - 8 (c) generating a packet from a plurality of subpackets, including the first  
9 subpacket;
  - 10 (d) asynchronously transmitting the packet across an asynchronous medium;
  - 11 and
  - 12 (e) extracting the subpackets from the packet and storing the subpackets in a  
13 plurality of buffers, each of the buffers associated with a destination time slot,  
14 the arrangement of subpackets within the buffers being determined by the first  
15 synchronization interval during which the subpacket was generated plus a fixed delay  
16 offset.
- 1 2. An apparatus for performing time slot switching of synchronous data across an  
2 asynchronous medium comprising:
  - 3 (a) serial to parallel interface for converting synchronous serial data related to  
4 a source time slot into synchronous parallel data units in accordance with a  
5 synchronous clock signal;
  - 6 (b) logic for formatting the synchronous parallel data units into a first  
7 subpacket in accordance with the synchronous clock signal, the first subpacket  
8 generated during a first synchronization interval of the synchronous clock signal;
  - 9 (c) logic for generating a packet from a plurality of subpackets, including the  
10 first subpacket;

11           (d)     logic for asynchronously transmitting the packet across an asynchronous  
12     medium;  
13           (e)     logic for extracting the subpackets from the packet and for storing the  
14     subpackets into a plurality of buffers, each of the buffers associated with a destination  
15     time slot,  
16           the arrangement of subpackets within the buffers being determined by a value  
17     representing the first synchronization interval plus a fixed delay offset.

1     3.     A method for transferring data comprising:  
2           (a)     packetizing a plurality of synchronous serial data streams into respective  
3     subpackets during a first synchronization interval, each subpacket associated with a  
4     source time slot;  
5           (b)     asynchronously transmitting the subpackets through an asynchronous  
6     medium; and  
7           (c)     reconverting the subpackets into synchronous data streams during a  
8     second synchronization interval having a fixed delay offset relation to the first  
9     synchronization interval.

1     4.     The method of claim 3 wherein (a) comprises:  
2           (a1)    converting the synchronous serial data streams into synchronous parallel  
3     data units.

1     5.     The method of claim 4 wherein (a) comprises:  
2           (a2)    formatting the synchronous parallel data units into a subpackets during a  
3     first synchronization interval.

1     6.     The method of claim 5 wherein (b) comprises:  
2           (b1)    generating a packet from a plurality of subpackets,

3           the packet including data identifying the first synchronization interval during  
4   which the subpackets were formatted from the synchronous parallel data units, and a  
5   destination time slot identifier associated with each subpacket.

1   7.     The method of claim 6 wherein (b) comprises:

2           (b2) asynchronously transmitting the subpackets through an asynchronous  
3   medium as part of the packet.

1   8.     The method of claim 3 wherein (c) comprises:

2           (c1) extracting the subpackets from the packet, and

3           (c2) storing the subpackets into a plurality of buffers, each of the buffers  
4   associated with a destination time slot, the arrangement of subpackets within the buffers  
5   being determined by a value representing the first synchronization interval plus a fixed  
6   delay offset.

1   9.     The method of claim 8 wherein (c) comprises:

2           (c3) reading the subpackets from the buffers as a plurality of parallel data  
3   units; and

4           (c4) converting the parallel data units into synchronous serial data streams.

1   10.    A apparatus for transferring data comprising:

2           (a) a source of synchronization signals defining a plurality synchronization  
3   intervals;

4           (b) an interface for packetizing a plurality of synchronous data streams into  
5   respective subpackets during a first synchronization interval, each subpacket  
6   associated with a source time slot;

7           (c) a mechanism for asynchronously transmitting the subpackets through an  
8   asynchronous medium; and

9 (d) an interface for reformatting the subpackets into synchronous data  
10 streams during a second synchronization interval having a fixed delay offset relation to  
11 the first synchronization interval.

1 11. The apparatus of claim 10 wherein (b) comprises:

2 (b1) logic for converting the synchronous serial data streams into synchronous  
3 parallel data units.

1 12. The apparatus claim 11 wherein (b) comprises:

2 (b2) logic for formatting the synchronous parallel data units into a subpackets  
3 during a first synchronization interval.

1 13. The apparatus of claim 12 wherein (b) comprises:

2 (b3) logic for generating a packet from a plurality of subpackets,  
3 the packet including data identifying the first synchronization interval during  
4 which the subpackets were formatted from the synchronous parallel data units, and a  
5 destination time slot identifier associated with each subpacket.

1 14. The apparatus of claim 13 wherein (c) comprises an asynchronous switch.

1 15. The apparatus of claim 10 wherein (d) comprises:

2 (d1) logic for extracting the subpackets from the packet, and

3 (d2) logic for storing the subpackets into a plurality of buffers, each of the  
4 buffers associated with a destination time slot, the arrangement of subpackets within the  
5 buffers being determined by a value representing the first synchronization interval plus a  
6 fixed delay offset.

1 16. The apparatus of claim 15 wherein (d) comprises:

2           (d3) logic for reading the subpackets from the buffers as a plurality of parallel  
3 data units; and  
4           (d4) logic for converting the parallel data units into synchronous serial data  
5 streams.

1 17. An apparatus comprising:  
2           (a) an asynchronous switch;  
3           (b) a plurality of circuit server modules coupled to the asynchronous switch,  
4 the server modules comprising:  
5               (i) a time division multiplex interface; and  
6               (ii) data adaptation logic; and  
7           (c) a source of synchronous clock signals coupled to each of the circuit server  
8 modules, the synchronous clock signals defining a plurality of synchronization intervals;  
9 the circuit server modules configured to perform synchronous time slot switching  
10 of synchronous data across the asynchronous switch.

1 18. The apparatus of claim 17 wherein the time division multiplex interface  
2 comprises:  
3 serial to parallel conversion logic for converting synchronous serial data streams  
4 into parallel data units.

1 19. The apparatus of claim 17 further comprising:  
2 parallel-to-serial conversion logic for converting a plurality of parallel data units  
3 into synchronous serial data streams.

1 20. The apparatus of claim 18 wherein the data adaptation layer comprises:  
2 an ingress data memory coupled to the time division multiplexed interface;  
3 an ingress context memory; and

4 subpacket construction logic for constructing in the ingress data memory a  
5 plurality of subpackets during one of the synchronization intervals, each subpacket  
6 associated with a source time slot and containing parallel data derived from a  
7 synchronous serial data stream received through the time division multiplexed interface  
8 subpacket.

1 21. The apparatus of claim 20 wherein the ingress context memory stores context  
2 data associated with a subpacket, the context data comprising a destination time slot  
3 identifier and a queue identifier associated with a subpacket.

1 22. The apparatus of claim 21 wherein the data adaptation layer comprises:  
2 an ingress queue coupled to the asynchronous switch; and  
3 packet construction logic for constructing in the ingress queue a packet including  
4 a plurality of subpackets and the respective context data associated with each  
5 subpacket.

1 23. The apparatus of claim 22 wherein the packet further comprises data identifying  
2 the synchronization interval during which the subpackets contained therein were  
3 constructed.

1 24. The apparatus of claim 17 wherein the data adaptation layer further comprises:  
2 an egress data memory having a plurality of playout buffers associated with a  
3 plurality of destination time slots; and  
4 depacketizing logic for receiving a packet from the asynchronous switch and for  
5 storing subpackets contained therein into the plurality of playout buffers in the egress  
6 data memory.

1 25. The apparatus of claim 24 wherein the data adaptation layer further comprises:

2           playout logic for synchronously supplying parallel data from the playout buffers to  
3   the time division multiplexed interface.

1   26.   A memory for storing data to be processed by a data processing system  
2   including an asynchronous switch, the memory comprising:

3           a data structure stored in the memory and usable to perform time slot switching  
4   of data, the data structure comprising:

5           a plurality of subpackets, each subpacket associated with a source time  
6   slot and containing parallel data derived from a synchronous serial data stream, each  
7   subpacket constructed during a common synchronization interval;

8           a synchronization tag identifying the common synchronization interval  
9   during which the plurality of subpackets were constructed;

10          data identifying the number of subpackets contained within the data  
11   structure; and

12          context data associated with each one of the plurality of subpackets, the  
13   context data including a destination time slot identifier corresponding to the source time  
14   slot associated with a subpacket.